

THE ILLUSTRATED GUIDE OF
SOUTHERN CALIFORNIA HARDY SUCCULENTS

by

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ABSTRACT

The Southern California area is experiencing increasing water shortages resulting in the need for plant material that has a high ornamental value as well as a low water requirement. The objectives of our project were to find, plant, and observe succulent plant material in the Southern California area to determine which succulents have a low water requirement, are low maintenance, disease and pest resistant, while adding beauty to the landscape. Succulent plant material was planted and observed in La Habra Heights, Newport Beach, and Laguna Beach to provide a range of climate zones. After two years of observing the plant material at the three separate locations succulents were chosen for our Illustrated Succulent Guide based on how well they did in each location with limited water, the ease of maintenance, and their overall appearance. We found hardy succulents that thrived in each location that met all our requirements and enhanced the existing landscapes. The list of hardy succulents in our guide are drought tolerant, disease and pest resistant, easy to plant and maintain, while providing unique and interesting forms, colors, and textures.

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Introduction

Succulents as a group of plants are represented by thousands of species that are found throughout the world. They come in all shapes, sizes and colors. While thriving in arid regions, succulents adapt very well to a Mediterranean climate. Southern California is a perfect example, with its hot summers and mild winters. When compared to traditional landscapes, succulents require less water, less fertilization, and no use of pesticide. The hardy plants also provide minimal maintenance and serve as fire retardant layer to your surroundings. Pleasing geometric shapes and eye-piercing flower colors combined with ever present humming birds and butterflies also provide year-round displays of nature in action. There are hundreds of publications and guides on succulents, however only a few provide information pertinent to Southern California. The goal of this project is to provide homeowners and design teams a reference guide allowing them to maximize the full potential of succulents in their landscapes. Succulents listed in this guide are in alphabetical order by botanical name within each genus. With a short description of the species, and information on its suitable microclimate, specific soil requirements and blooming period, this guide will be an aid to successful landscape use in southern California.

Literature Review

Succulents are plants that have water storage organs that give them the capacity to withstand drought (6). Depending on their native origin habitat, different types of organ specialization occur. Both leaf succulence and stem succulence help the plants survival in arid climates. Succulents have become highly specialized at adapting to arid and semi-arid regions around the globe (2). Leaf succulence has evolved to enable the storage of water in large vacuoles within parenchyma cells below the epidermis (7). Leaf succulence is related to regions that have relatively short dry seasons. If the dry season is a lengthy one then the plant is more likely to have adapted stem succulence as a means of survival. Stem succulence, which is common in the cactus family, is found in very arid environments because of the minimizing or elimination of their leaves and the ability of green stems to photosynthesize. Some cactus can reach huge sizes by taking advantage of stem succulence, but they still require consistent watering to maintain its life cycle (6). The characteristic thick, fleshy leaves with a waxy, outer layer help lessen water loss due to transpiration (1).

Many of the physical characteristics that succulent families share are due to convergent evolution. Their associated shapes and forms are a result of selective pressures focusing on their volume to surface ratios (6). The result is a wide variety of geometric shapes and sizes in a fascinating array of colors (8). Many of the larger species of succulents have decorative

foliage with geometric shapes displayed the year around (9). Others have inflorescences that are very attractive in both summer and winter.

Succulents have developed the special ability to take up carbon dioxide at night and use that CO₂ during the day during photosynthesis called Crassulan Acid Metabolism, or CAM. With the utilization of organic acids, storage of CO₂ takes place at night when the plant opens its stomates and allows gas exchange during periods of decreased temperatures and higher relative humidity. The transpiration rates of CAM adapted plants are very low and aids in the survival in arid regions (11).

Southern California, located in a southwest corner of the North American continent has a diversity of micro-climates. A cold continental air mass meets the warm Pacific Ocean thus creating a wide range for variety and diversity in its plant communities. Southern California encompasses many climates and microclimates that have been divided up into different climate zones. Each zone has its average minimum winter temperature, as well as seasonal rainfall amounts, and average summer temperatures as well as an overall summary of the microclimate within the zone. Microclimates also play a very important role in any garden. It is the physical characteristics of any landscape encompassing anything from the fence and patios to the orientation of the house (12). Succulents have one major requirement to overcome all the different landscapes and it is the excellent drainage that keeps succulents flourishing. *Sunset's* climate zones 18 through 24 probably represent the majority of zones closest to the Pacific, while Subtropical desert climate zones 11, 13 and Southern California mountains climate zone 7 dominate to the east (10).

Zones 18 and 19 are the interior climates with small influence from the Pacific Ocean and are mainly dominated by the cold continental air mass. Chill adapted plants adapt well to the

surrounding hilltops and basins filled with cold air. Zones 20 and 21 are powered by both, ocean and inland air. Summer heat and winter cold sustain a great variety of pears, peaches and apples. Mainly controlled by the ocean warm air, zones 22 and 23 are characterized by warm winters and mild temperatures with light possibilities of occasional frost. Santa Ana winds pass through Cajon Pass and Soledad Canyon during fall and winter. The winds are characterized by very hot dry air dehydrating plants along its route out to the coast. Chill adapted plants do not survive this coastal influence. Zone 24 is dominated by warm pacific air and coastal fogs. Stretching all along the coast from Point Conception to Tijuana, it illustrates a very mild subtropical climate. Also influenced by warm Mexican waters, Zone 24 is well suited for subtropical plants thriving outdoors. However, the coastline is rigged with canyons, hills and countless slopes that carry cold continental air from the mountains out to the ocean. Such diverse microclimates along the coastline make zone 24 very unique to southern California (10).

Sunset's climate zones correspond to winter minimum temperatures which in general establish the threshold for plant's cold hardiness. Zone 7 winter lows are 26-35 degrees F, and desert zones 11 and 13 summer temperature ranges between 90 and 110 degrees F. Inland dry and mild zones 18 through 21 experience winter lows in range of 20 and 43 degrees, and coastal zones 22 through 24 enjoy warm winters with mild temperatures from 40 to 50 degrees which also could escalate to above 90's during Santa Ana winds. By design, succulents have the ability to store water to tolerate very dry and harsh environment. Some succulent species even withstand climates below freezing, while others are very sensitive to any cold (1). Such diversity in climates makes succulents widespread all over southern California's climates.

Precipitation in coastal climates is much higher compared to inland and could occur at any time due to warmer winters and cool summers. Southern California gets all its rains in

winter and pretty much none during the summer. Preservation of water in summer, avoiding leaching of nutrients and staying free of water logging during the winters are the main factors plants have to overcome. From tropics to cold regions, southern California presents endless planting possibilities. Knowing plant's water, temperature and soil requirements, any habitat could be created in southern California. That is why succulents are the best choice; all they require is good drainage (1).

Succulents' water storage organs enable them to survive very dry and dismal conditions over long periods of time. In locations that possess such conditions, most other plants would languish or even die, while the succulents thrive. Their lower transpiration rates are highly efficient and give them another edge up when competing with other plant materials (11). Habitats are created where succulents thrive. Humming birds are in abundance and certain yuccas give refuge to moths that pollinate them (6). Another beneficial aspect of succulents is its role in erosion control. Many species are hardy ground covers and some are spread out on large banks (9).

The vast majority of succulents are propagated by division or from cuttings. Although growing from seed presents quite a challenge due to a very slow growing time frame and high mortality rate of seedlings, many gardeners prefer propagation by seed that results in a desired variation of color and form (1).

Succulents' water requirements are very straight forward. During the growing season, they should be watered regularly, while during the winter and rainy season should be kept on a dryer side. The main concern when watering succulents is to never over water them. Well drained soils are a must. Knowing soil texture and structure aids in creating the right drainage. Healthy plants require healthy soil. Poor soils retard growth. Succulents are no exception. Soils

rich in organic matter and good drainage would provide all the essential nutrients to plants and are ideal for succulents. No extra fertilization is required. The use of slow-release fertilizer with low nitrogen content may be most useful during flowering and fruiting stages (1). Succulents are easy to grow and they provide a colorful display of flowers throughout the year. The only maintenance they need is regular watering if too dry and occasional addition of mulch to aid in improving soil aeration and drainage. Snails and mealybugs can interfere with succulents. Warmer and dryer conditions invite mealybugs, and the excess of water brings snails. Weeds also could invade succulents display, especially in ground covers. Whatever the obstacle is, one approach seems to work with all. Single handedly removal of weeds and pests until they are gone is the best control for any garden. Although chemical pesticides provide temporary control of insect pests, removal of the pest offers the best long term solution.

The objective of this project is to produce a guide which will serve as an all in one information source on landscape succulents that thrive in southern California. In addition to one photo depicting the whole plant and one photo of the inflorescence, information will be listed for every species illustrated and will include: name of species, the family of the taxon, brief description, common name, native range, possible landscape uses, flowering intervals, growing conditions, growing methods and zone hardiness.

Materials and Methods

Personal observations of landscape succulents that thrive in Southern California created the foundation of our guide. Many trips to botanical gardens, state parks, and wilderness reserves provided numerous examples of succulents that flourish in both wild and managed conditions. Succulents that are included in this guide have similar natural attributes that identify them as hardy. Succulents that are difficult to cultivate have been omitted from this guide. Frost hardiness and heat tolerance were the first two parameters that the plants had to meet. Then the plants susceptibility to pests and diseases were evaluated. Years of observation through personal experience enabled the evaluation of the plants resistance to pests and disease. Propagation was also a factor when considering plant material. Plants that cannot be propagated relatively easily were also omitted. Longevity and aesthetic values were also factors.

In addition to countless visits to the locations mentioned above, succulent were planted in one gallon and five gallon in the landscapes of three different Southern California locations. Laguna Beach, La Habra Heights and Newport Beach have duplicate plantings of succulents in both landscaping and containers. Plants that have been under observation include: *Abrometiella scapigera*, *Aeonium canariense*, *Aeonium arboreum*, *Aeonium arboreum* var. *atropurpureum*, *Aeonium arboreum* 'Tricolor', *Aeonium decorum cristata*, *Aeonium gomerense*, *Aeonium simsii*, *Aeonium spathulatum*, *Aeonium sub planum*, *Aeonium* 'Cyclops': *Aeonium tabulaeforme*, *Agave Americana*, *Agave Americana* var. *marginta*, *Agave attenuata*, *Aloe arborescens*, *Aloe brevifolia*,

Aloe ciliaris, *Aloe plicatilis*, *Aloe ramosissima*, *Aloe saponaria*, *Aloe striata*, *Aloe spinosissima*,
Aloe vera, *Bulbine* spp., *Calandrinia spectabilis*, *Crassula arborescens*, *Crassula commutate*,
Crassula corymbulosa, *Crassula falcate*, *Crassula multicava*, *Crassula muscosa*, *Crassula*
oblique, *Crassula portulacea*, *Delosperma nubigenum*, *Echeveria amoena*, *Echeveria setosa*,
Glottiphyllum davisii, *Graptopetalum paraguayense*, *Haworthia attenuata*, *Haworthia*
cymbiformis, *Kalanchoe fedtschenkoi*, *Kalanchoe marmorata*, *Kalanchoe tubiflora*, *Plectranthus*
amboinicus, *Sanservieria trefasciata*, *Sedum morganianum*, *Sedum nicacense*, *Sedum nadum*,
Sedum rubrotinctum, *Synadenium grantii* 'Rubra', *Villadia batesii*, *Yucca elephantipes*.

Succulents that did not meet the criteria have been dropped from the list.

Results

The Illustrated Guide of Southern California Hardy Succulents consists of over twenty succulents ranging from deep blue to burgundy, from sharp to smooth, and from rosettes to branched. All our succulents can withstand prolonged drought, need little water and fertilizers, and do not require the use of growth regulators, and can endure cold temperatures once established. This diverse group of plants are a perfect fit for any landscape in Southern California. The succulents that are depicted in the following illustrated guide have been propagated, planted, and observed over the last two years by Darren Chard and Zhanna Safiulina. All pictures in the guide have been taken by Darren Chard and Zhanna Safiulina of plant material grown in La Habra Heights, Newport Beach, and Laguna Beach. All the succulents described have shown to be drought tolerant, disease and pest resistant, easy to propagate, easy to maintain, and add ornamental value to any landscape.

Discussion

The described succulents have all this in common: natural low maintenance, sustainability, durability, diversity, and are available year round at most nurseries. We have found over the last two years that one of the most important aspects to successful succulent landscapes is the propagation stage of the process. First, we take a cutting from a mother plant with a pair of pruners to get a nice clean cut. Second, we let the cut edge of the cutting callous over in a dry shaded area. Third, we prepare a soil mix with a cement mixer using two parts garden soil to one part perlite to one part agriculture washed sand. Next, we plant the prepared succulent cutting into the proper sized nursery container with our succulent soil mix, and place it in the shade. After the plants have established some root material we then move them into a lathe structure. From there we either find a suitable place in the landscape and plant it or we

transplant the plant into a larger container for future use. When we are transplanting a succulent into the ground we remove the plant from its container and disrupt any roots circling the root ball. The plant is then placed into a prepared hole with a prepared succulent soil mixed with native soil in the soil transition zone. We then back fill and mulch or plant a suitable ground cover to shade to soil surface to keep it cool. We found that this process is more successful during the cooler periods of the year and protection of new cuttings from too much heat or sunlight is critical. The plant material in our guide proved to be prolific when planted in the manner described.

Picture 1 Succulents being planted in our test plots in La Habra Heights.



Picture 2 Succulents being planted in our test plots in La Habra Heights.



Picture 3 Succulents being planted in our test plots in La Habra Heights.



Picture 4 Eighteen months after succulents have been planted in our test plots in La Habra
Heights corresponding to picture 1.



Picture 5 Eighteen months after succulents have been planted in our test plots in La Habra
Heights corresponding to picture 2.



Picture 5 Eighteen months after succulents have been planted in our test plots in La Habra
Heights corresponding to picture 2.



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